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On quantitative methods in the social sciences

by

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A discussion of quantitative methods in the social sciences - what kind of discourse is this? History of science? Philosophy of science? Science itself? Levels of discourse need to be distinguished if confusion is to be avoided. Of use here is Radnitzky's suggestion that the enterprise of metascience should tack inter alia between the following perspectives:

(A) One may study the logical, semantical, information-theoretical and epistemological aspects of symbolic systems and tools.
(B) Or, one may take a 'genetic' perspective and concentrate on the whole production-and-product system.
(C) Or, one may want to include man, the agent in the picture: the producers and users of scientific knowledge are viewed in a science-in-society perspective....
(E) Eventually, one may ask what science means for man, and furthermore evaluate its impact from a futurological point of view ('critical' perpective).[1]

Different sorts of questions about quantitative methods are associated with the different perspectives. I shall present discussion under three heads, the particular questions asked being as follows:
(A) Should the casting of theories in quantified form serve as an ideal for the social sciences?
(B) What sort of advantages might quantitative methods confer when they penetrate a particular social science?
(C/E) Does the increasing use of quantitative methods lead to greater social control?

The first question is worth discussing because of the great influence of what Radnitzky calls the 'logical empiricists'(which comprise Logical Positivists, Popperians, Ordinary Language Philosophers and Pragmatists) on the philosophy of science in the Anglo-Saxon world. They have been more concerned either with general philosophy of science or with the philosophy of natural sciences than with the philosophy of the social sciences, but have nonetheless developed two alternative positions with respect to the latter:
(A) 'One position ... is that because existing human sciences do not meet the formal adequacy criteria related to the models of explanation,of concept formation, etc., that articulate the Ideal of Unified Science, these disciplines eo ipso lack 'scientificity'; they are more artes than scientific disciplines and hence may be and should be ignored by logical empiricists.'

(B) 'Those who apply the Unified-Science-idea also to the cultural sciences will recommend even there the patterning of these fields upon (idealised) physics; this could involve bringing them as near as possible to applied mathematics by developing postulational systems with psychological interpretation, with sociological interpretation, etc., as the case may be. Only by following this recommendation may the cultural sciences too hope to become respectable. This recommendation has found a sympathetic hearing among social scientists in the English-speaking world and also in Scandinavia. Many of them have become not only sympathisers of logical empiricism (by accepting its vision of science) but also users of logical empiricism - by trying to utilize its theories, e.g., its theories of empirical significance, of operational definitions, of the 'verification' of hypotheses etc.' [2]

Social scientists of persuasion (B) are under pressure from at least three directions:
(i) Paradoxes have appeared within the logical empiricist framework itself. Some of these have emerged as logical empiricists have tried to specify the conditions for scientific explanation. They have not yet been adequately dealt with as is evidenced by an example cited by Woodward: 'Consider the generalisation 'All men who take birth control pills regularly, won't get pregnant.' This generalisation is universal in scope and supports counterfactuals. It seems to satisfy the usual syntactic conditions for law-likeness. Can it be used to explain why Mr. Jones, a man who has been taking birth control pills regularly, fails to get pregnant? ... I think it is clear that (this) is a defective explanation ... This is of course reflected in the fact that even if Mr. Jones stopped taking birth control pills, he still would not get pregnant. Given that Mr. Jones is a man, whether or not he takes birth control pills, has, as we say, 'nothing to do' with whether or not he gets pregnant.'[3] So we've got to load on another restriction, perhaps of a type not easily reconciliable with the logical empiricist framework. This sort of difficulty points to difficulties with logical empiricist postulates themselves.

(ii) Radnitzky points out that for logical empiricism 'physics, as we know it, is a sort of touchstone: if not even physics, which among existing disciplines was considered to approximate the ideal empirical science most closely, does fulfil the adequacy criteria for the appraisal of finished products (theories etc.) then the ideal itself, the ideal of unified science as explicated, is thereby demasked as utopian.'[4] If Feyerabend is right, then just this state of affairs exists:

'My aim in the lectures (which were the basis for Against Method was to show that some very simple and plausible rules and standards which both philosophers and scientists regarded as essential parts of rationality were violated in the course of episodes (Copernican Revolution; triumph of the kinetic theory; rise of quantum theory; and so on) they regarded as equally essential. More specifically, I tried to show (a) that the rules (standards) were actually violated and that the more perceptive scientists were aware of the violations; and (b) that they had to be violated. Insistence on the rules would not have improved matters, it would have arrested progress.'[5]

(iii) In the field of the social sciences, logical empiricist metascience has to compete with hermeneutic-dialectic metascience. Hermeneutic-dialectic metascience has the advantage that it has been developed specifically for and with human sciences, whereas logical empiricism has dealt with them only tangentially. Habermas, writing in the hermeneutic-dialectic tradition suggests that there are three knowledge-constitutive interests relevant to the social sciences: the technical, the hermeneutic and the emancipatory. The manipulation of the environment, physical and social, is a technical interest. The hermeneutic interest is 'the interest in intersubjective mediation of participatory understanding with respect to possible meaning of actions or of texts etc. that connect contemporaries and that pass between the past and present generations. This is an interest in the conceptual availing of possible ways of living. Thus it includes also the interest in improving one's self-understanding, which in turn is (dialectically) mediated by understanding of others.'[6] The emancipatory interest 'involves the conscious drawing up from an ethical base of plans, strategies and political lines and acting with these as guides in concrete situations ... It concerns the emancipation, through enlightenment, from the quasi-natural forces of history and society. The type of intellectual activity it entails is criticism, which sets the consciousness free from its dependence upon hypostatized forces, because it reveals the real forces and facilitates their steering and control.'[7] Logical empiricism would confine social science to the technical 'moment' only: 'thereby it forces the practice of life (lebenspraxis) entirely into the confines of the functioning of instrumental action: technical success becomes the only secure standard; and with it technocracy the self-fulfilling, self-reinforcing hidden image of man and society.'[8]

Where have we got? It is logical empiricism that suggests that the casting of theories in quantified form should serve as an ideal for the social sciences. But I have suggested reasons (internal difficulties, problems of application, dangerous limitations of scope) for doubting the soundness of logical empiricist metascience

especially in respect of social science. To the extent that these reasons are cogent, the quantification ideal is dethroned. This is not to say that quantification is entirely inappropriate in the social sciences - a study of economics or demography will show that it has an important part to play at the technical level. And since we are concerned with language in hermeneutics, the entry of mathematics into linguistics may mean that mathematics has a small role to play at this level. But it does mean that cases will have to be judged on their merits.

II

Quantitative methods have not penetrated the territories of the various social sciences at the same time or to the same degree. One field where the quantitative revolution is fairly recent is history. If the battle is over, the guns have not long ceased to smoke and one still encounters a certain amount of counterrevolutionary guerilla activity. On the assumption that life is more exciting on the frontier, therefore, I shall draw my examples from the cliometric literature?
Is history a social science? If it is not, discussion here of cliometric examples is off the point. Liberation of our minds from the logical empiricist straitjacket helps us to answer this question in the positive. At the technical level one may note that historians, with increasing frequency, apply the methods of say, economics and demography to bodies of historical data, i.e. they are employing social scientific techniques. But many historians have chosen to deny that their discipline is a social science on the grounds that they wish to preserve the hermeneutic level i.e. the function of history which seeks to interpret times past for the current generation. Implied here is a logical empiricist view of science which excludes hermeneutics. On the hermeneutic-dialectic view the existence of a well-developed hermeneutic level makes history perhaps the paradigm social science.

What new opportunities do quantitative methods (including the use of computers) offer historians? Let's discuss this under two heads:

A. High speed data processing and descriptive statistics

High speed data processing offers the opportunity of 'the analysis of those vast deposits of documents, containing vital data, but whose sheer bulk has now daunted all researchers'[9] . And so we find the 1427 land register of Florence being subjected to analysis for the first time, computer programmes being written to remove the chore of reconstitution of families by card index from the work of historical

demographers and a time series of Parisian rents from the fifteenth to the seventeenth centuries being calculated, just to cite the examples Ladurie adduces.[10] There are implications of this for methodology:

(a) As Furet points out: 'The historian's use of computers ... is ... a very useful theoretical discipline, in that the formalization of a documentary series which is to be programmed forces the historian from the very beginning to abandon epistemological naïveté, to construct the actual object of his research, to scrutinise his hypotheses, and to make the transition from implicit to explicit.'[11]

(b) There is a shift of interest from the event to series and structure. An account of the desirability of this change is given by Furet: 'Since the event, a sudden irruption of the unique and the new into the concatenation of time, cannot be compared to any antecedent, the only way of intetgrating it into history is to give it a technical meaning ... (On the other hand) the series reveals a time which is no longer the mysterious occasional spurt of the event, but an evolutionary rhythm which is measurable, comparable, and doubly differential in that it can be examined within one series or as between two or more.'[12]

Quantitative methods and computers can be applied to certain sorts of historical problem; as these come to be discussed they have their impact on practices in the rest of the field.

Of course quantitative methods do not do it all for us as a discussion of Example I will show:

Example I - Hermeneutics and the Bennet Barrow Whipping Diary

One of the questions that have been debated by historians of slavery in the United States is the question of how severe exploitation of slaves was. Relevant to this question is a discussion of the relative prevalence of positive and negative labour incentives under slavery. One of the negative labour incentives was whipping. How important was this?

Fogel and Engerman approach the problem as follows:
'Reliable data on the frequency of whipping is extremely sparse. The only systematic record of whipping now available for an extended period comes from the diary of Bennet Barrow, a Louisiana planter who believed that to spare the rod was to spoil the slave. His plantation numbered about 200 slaves, of whom 120 were in the labour

force. The record shows that over the course of two years a total of 160 whippings were administered, an average of 0.7 whippings per hand per year. About half the hands were not whipped at all during the period.'[13]

What are we to make of this average? It seems to invite a physical interpretation; if we assume that the quantum of pain actually administered determines the social significance of the institution of whipping, then we may be inclined to conclude that whipping was a relatively unimportant negative labour incentive.

Gutman, in his critique of Fogel and Engerman, argues otherwise: 'Southern law permitted slaveowners to punish their chattel, and most historians agree that whipping served as the most common form of physical punishment, figuring as a central device in imposing order over troublesome slaves and in revealing the source of authority in a slave society. The essential statistic, therefore, is not the average number of whippings per hand per year. It is much more relevant to know how often the whip was used ... In 1840-41, Barrow's slaves were whipped 160 times. A slave - 'on average' - was whipped every 4.56 days ... (This is a) quite high average and for good reason. If whipping is viewed primarily as an instrument of labour discipline and not as the mere exercise of arbitrary power (or cruelty), whipping three slaves every two weeks means that this instrument of physical discipline had an adequate social visibility among the enslaved. Slave men and women were whipped frequently enough ... to reveal to them (and to us) that whipping regularly served Barrow as a negative instrument of labour discipline.'[14]

Gutman's critique moves at the hermeneutic level when he explicitly considers the question: 'What did whippings <u>mean</u> to slaves?' If one is dealing with incentives, one has to deal with meaning. He argues that the effect of each whipping, far from being confined to the physical pain of the slaves directly involved, extended to all slaves on the plantation in that it 'revealed the source of authority in a slave society'. This is far more plausible than the view implicit in Fogel and Engerman and so Gutman's critique succeeds.

Note that in <u>both</u> analyses an elementary statistic was calculated and interpreted. The one based on sound hermeneutic work carries weight; the other based on defective interpretation does not.

B. Models

Another opportunity offered by quantitative methods is that of model building. Briefly a mathematical model consists of a set of equations containing parameters, exogenous variables (variables set outside the model) and endogenous variables (variables whose values are determined by the equation set). Economists use such models incessantly. In historical work users of models can do two things:

(i) They can explain observed values of the endogenous variables by referring to values of exogenous variables and parameters and to the mechanism represented by the model.

(ii) They can calculate what the values of the endogenous variables might have been had values of exogenous variables and/or parameters been different, the model itself remaining the same. This involves counterfactuals, aspects of which are discussed in Example 2.

Example 2 - Counterfactuals and the price of slaves in the U.S. South in 1890

Was the American civil war necessary for the abolition of slavery? 'Many writers', observe Fogel and Engerman, 'have been convinced that slavery would have been extinguished even in the absence of a Civil War because of the natural geographic limits to which the cotton culture was confined, and because of the pressure generated by rising urbanization ... The 'natural limits' thesis holds that the rise in ratio of slave labour to land eventually would have reduced the value of a slave to less than his subsistence cost. The rise in the labour-to-land ratio seemed assured, since the land suitable for cotton was limited while the supply of labour was bound to grow with the growth of the slave population. The cities would not have provided an outlet for this excess because the cities were a hostile environment, an environment in which slavery could not persist.'[15]

Fogel and Engerman develop, using the framework of supply and demand analysis, an equation which 'enables one to predict the change in slave prices, given information on the cotton prices, the output of cotton, the size of the labour force employed in cotton, the cost of slave maintenance, and the market rate of interest. The values of all these variables for the post-Civil War era are known - except the rate of growth of the slave labour force that would have been employed in cotton production and the cost of slave maintenance. However, the unknown values are supplied by the natural limits thesis itself ... The results of the test ... show that far

from falling, the prices of slaves would have risen ... Prime hands in 1890 would have sold at 52 percent more than they did in 1860'.[16]

This argument clearly involves a counterfactual: Had slavery not been abolished, the price of slaves in 1890 would have been higher than in 1860. Now counterfactuals raise enormous technical problems in the field of logic; as far as I can tell, resolution of these is not in prospect. Yet counterfactuals are clearly part of historical discourse - they do not appear only in the writings of cliometricians. By way of illustration of this assertion, a couple of examples from Sir Llewellyn Woodward, The Age of Reform 1815-1870, OUP, 1938 (revised edition 1962):

p.4. '... The changes (in productive technique) could not have taken place on a large scale if there had not been corresponding progress in agriculture, in methods of transport, in the organisation of trade and the diffusion of credit.'

p.22. 'Even if there had been facilities for carrying out a well-planned administrative policy, the central authorities were unlikely to do anything unless parliament called upon them to act, and parliament would remain unresponsive to public opinion of a moderate kind as long as the house of commons did not properly represent the people of England.'

So historians should perhaps try to specify criteria for assessing when there are reasonable grounds for asserting a counterfactual. Two are suggested:
(a) The counterfactual should have some bearing on what actually happened. This condition is satisfied by Fogel and Engerman - the 'price of slaves in 1890' has to do with the necessity for the American Civil War.
(b) The counterfactual should be the outcome of a model or argument whose general form with different initial conditions supports actual events. This condition is also satisfied - supply and demand models are frequently used to explain observed prices.

Fogel and Engerman's achievement, then, is to provide grounds for rejecting the 'natural limits' thesis and so furthering the debate about American slavery. Their model-building exercise appears to have been worthwhile.

Quantitative methods in history increase the number of possible directions of research. They also modify traditional practices. Are these not marks of fruitful progress?

III

A great many people see the computer as the symbol of the technocratic society they live in. This is by no means entirely irrational. In the United States your credit rating is stored on computer by anonymous clerks; in West Germany your status as a possible terrorist is fed into a state computer by an anonymous official. These information networks serve one purpose - that of control.

Such networks could well be the object of social scientific investigation. They are not, however, the product of social science. Social scientists who use the computer are not necessarily involved in building up control networks. Social scientists who do not use the computer may very well be so involved. It is Chomsky's concern in his essay on 'Objectivity and Liberal Scholarship' to expose this aspect of 'the developing ideology of a new privileged elite.' He discusses an exponent of this ideology in the following terms:
'Various strands of this ideology are drawn together in a recent article by Zbigniew Brzezinski in which a number of the conceptions and attitudes that appear in recent social thought are summarized - I am tempted to say 'parodied.' Brzezinski ... sees a 'profound change' taking place in the intellectual community, as 'the largely humanist-oriented, occasionally ideologically minded intellectual-dissenter, who sees his role largely in terms of proferring social critiques, is rapidly being displaced either by experts and specialists, who become involved in special government undertakings, or by the generalists-integrators, who become in effect house ideologues for those in power, providing overall intellectual integration for disparate actions.' ... It would hardly be rewarding to try to disentangle Brzezinski's confusions and misunderstandings. What is interesting, rather, is the way his dim awareness of current developments in science and technology is used to provide an ideological justification for the 'increasing role in the key decision-making institutions of individuals with special intellectual and scientific attainments' based in the university, 'the creative eye of the massive communications complex.'[17] Note that Brzezinski's mode of argument is not defective science no defective technology but defective ethics; such an argument can only hope to persuade in an environment of value-free positivist social science where the capacities of its practitioners for ethical argument have atrophied.

Let's take another example - this time closer to home. In August 1979, Møller and Schlemmer presented a paper entitled 'Alternatives to urbanisation: The preferences and orientation of migrant workers in a South African city' to a Workshop on Rural Development held by the Urban Foundation. Leave aside the question of whether a consideration of alternatives to (African) urbanisation is not just the kind of topic the South African state would like to see social scientists giving attention to, and consider the argument about alternatives. The central finding of the survey is:

'The increasingly rigid provisions in terms of influx control legislation in the seventies and mounting land densities have produced a clear majority of migrants who perceive no adequate security of tenure in either rural or urban areas. This implies a critical problem of morale affecting a very substantial proportion of the labour force. The problem is urgent and growing.'[18]

Note the use of the term 'morale'. It is most often used by the army in referring to subjective factors affecting the willingness of soldiers to fight hard or by business to refer to the willingness of workers to work hard. The army and business want you to be happy - but for their purposes. Is this unfair? Let's read on:
'Given the enormous size and pervasiveness of the migrant labour force, what Natal ... need(s) is a type of development which will facilitate what most migrants in Durban appear to want: a secure non-city base, ease of contact with families, and opportunities for permanent or semi-permanent 'target work' in the city or appropriate industrial growth points ... If adequate trac s of land could be added to KwaZulu near Durban, Pietermaritzburg, Newcastle, Richard's Bay and other growth points, and this land (as well as any other suitable land) could be planned from the outset as fairly dense, relatively intensive, semi-economic, peri-urban garden-development schemes for 'commuter' migrants, then it would represent a fair compromise between conflicting needs ... If such developments could emerge, the morale of migrants (who would become commuters) would be greatly improved, the social costs of migrant labour would be minimised, a small source of vegetable production to serve city markets could become available, and the trend towards the very dense informal settlements and 'shack-farming' on the outskirts of urban areas could be meaningfully combated. Above all, perhaps, the divided commitments of the typical Natal migrant worker could be accommodated in large measure, making a significant contribution to morale and political stability among large sections of the urban labour force.'[19]

Two new interests emerge here
- 'above all' political stability, interestingly not mentioned as an interest among the migrant survey respondents at all.
- the combating of the 'trend towards the very dense informal settlements ... on the outskirts of urban areas.' There does not seem to be evidence in the survey that this is a migrant interest either; it looks more like the concern of the town-planner and property owner.

The distorted hermeneutic in this mainly technical study is clear. We (academics, big businessmen) may achieve some understanding of the meaning-world of migrant labourers from a study of this sort, but we are unable (within its limits) to establish communication with the objects of the study or enter into a dialogue with them. After all, we aren't really interested, are we? As long as there is 'high morale' and 'political stability', that will do. Radnitzky speaks truly when he observes that for quasi-naturalist social science 'the ideal-type of the social scientist will be that of the strategist, of the Machiavellian Prince's Counsellor.'[20]

The purpose of these two examples is to indicate that assistance in the project of extending social control arises from a defective social scientific practice (quasi-naturalism) legitimated by a defective philosophy of social science (logical empiricism). Whether one's practice is defective or not does not depend on whether one uses quantitative methods, though as we have seen, attempts are made to buttress social scientific authority by a non-rational appeal to command of esoteric knowledge (including mathematics). An end to these attempts would liberate quantitative methods from guilt by association. Then more of us (the people) might become free really to understand Bertrand Russell when he wrote:
'At the age of eleven, I began Euclid, with my brother as a tutor. This was one of the great events of my life, as dazzling as first love. I had not imagined that there was anything so delicious in the world.'[21]

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NOTES:

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4 G. Radnitzky, op. cit.,

5 P. Feyerabend, Science in a Free Society, New Left Books, 1978, p.13.

6 G. Radnitzky, op. cit., p. II-7.

7 G. Radnitzky, op. cit., p. II-7.

8 G. Radnitzky, op. cit., p. II-11

9 E. LeRoy Ladurie, The Territory of the Historian, Harvester, 1979, p.3.

10 Ladurie, op. cit., pp. 3-5.

11 F. Furet, Quantitative History in (ed.) F. Gilbert and J.R. Graubard, Historical Studies Today, Norton, 1972, p.49.

12 Furet, op. cit., pp. 54-55.

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15 R.W. Fogel and S.L. Engerman, op.cit., vol.I, pp. 94-95.

16 Fogel and Engerman, op. cit., vol. I, pp. 95-96

17 N. Chomsky, American Power and the New Mandarins, Penguin, Harmondsworth, 1969, pp. 28-29. The reference to Brzezinski is 'America in the Technetronic Age,' Encounter, vol. 30, Jan. 1968, pp. 16-26.

18 Møller and Schlemmer, op. cit., p. 25.

19 Møller and Schlemmer, op. cit., pp. 28-29.

20 Radnitzky, op. cit., p. II-139.

21 B. Russell, Autobiography 1872-1914, George Allen and Unwin, London, 1967, p.36.